REMARKS

Applicant thanks the Examiner for the thorough examination of the application. The specification has been amended to improve its language. No new matter is believed to be added to the application by this amendment.

Status Of The Claims

Claims 1 and 3-30 are pending in the application. Claims 13-18 and 26-29 have been withdrawn from consideration by the Examiner. Claim 2 has been cancelled and its subject matter has been incorporated into claim 1, and the amendments to claim 1 also find support in Figures 9-15. Allowable claims 5 and 21 have been amended to stand as independent claims by incorporating the subject matter of the base and any intervening claims. Claims 21 and 25 have also been amended to better reflect the disclosure in Figure 9E. Claim dependencies have been amended so as to eliminate any dependency on cancelled claim 2. Claim 30 corresponds to claim 3.

Rejection Under 35 U.S.C. §112, Second Paragraph

Claims 21 and 25 are rejected under 35 U.S.C. §112, second paragraph as being indefinite. Applicant traverses.

At page 2 of the Office Action, the Examiner turns to Figure 9E of the application and notes that the groove does not go through the entire gate insulating layer 110. Claims 21 and 25 have been amended to reflect the disclosure in Figure 9E by reciting (in claim 21) "forming at

least one groove through the gate insulating layer, the passivation layer and at least part of the inorganic insulating layer." Claim 25 has been similarly amended.

However, amended claims 21 and 25 do not disclaim the possibility that the groove can be etched all the way down to the substrate. This possibility is described in paragraph 0062 starting at page 17, line 15 of the specification:

> **[0062]** In FIG. 10D, the first inorganic insulating layer 210 may be etched until the PR layer 240 (of FIG. 10C) is entirely removed, and a second groove 265 forms through the first inorganic insulating layer 230 and the organic insulating layer 220. Even though the first inorganic insulating layer 210 remains in the seal pattern region "SR" corresponding to the slit 255 (of FIG. 10A) in this embodiment, the first inorganic insulating layer 210 of the seal pattern region "SR" may be entirely etched according to an etching condition that will expose the first substrate 200 through the second groove 265 in another embodiment.

As a result, the claims are clear, definite and have full antecedent basis. This rejection is overcome and withdrawal thereof is respectfully requested.

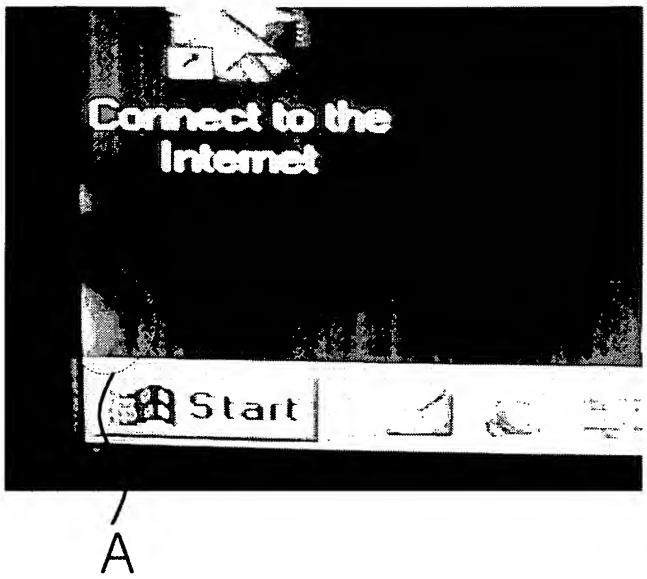
Rejections Based On Tanaka

Claim 1 is rejected under 35 U.S.C. §102(b) as being anticipated by Tanaka (U.S. Patent 6,011,608). Claims 2-4, 19, 20 and 25 are rejected under 35 U.S.C. §103(a) as being obvious over Tanaka in view of Moon (U.S. Patent 6,683,668). Applicant traverses.

The incorporation of claim 2 into claim 1 overcomes the anticipation rejection over Tanaka. Applicant now addresses the §103 rejection.

The Present Invention And Its Advantages

The present invention pertains to a novel liquid crystal display device that eliminates white stains generated at the periphery of the liquid crystal device cause by the chemical reaction between the amine in epoxy sealant and the passivation layer. This white stain is illustrated in Figure 6 of the application, which is reproduced below.



The passivation layer is formed from an organic material such as benzocyclobutene (BCB) that can readily react with the epoxy sealant. The formation of white stain is eliminated by isolating the passivation layer (which can be an organic insulating layer) from the sealant by at least one inorganic insulating layer. The inorganic insulating layer(s) are formed from relatively inert materials such as silicon nitride (SiN_x), silicon oxide (SiO_2) or silicon oxynitride (SiO_xN_y).

In the invention, the contact portion of the seal pattern and the organic layer is reduced or eliminated, and the seal pattern contacts the other layer that has an excellent contact property.

Accordingly, the adhesion of the seal pattern is improved such that defects such as a breakdown of the seal pattern are prevented. Moreover, defects such as a stain at the periphery of the seal pattern due to contamination of a liquid crystal layer is prevented.

The present invention has many embodiments, and a typical embodiment can be found in claim 1:

1. A liquid crystal display device, comprising:
first and second substrates facing and spaced apart from each other;
a first inorganic insulating layer over an inner surface of the first substrate;
a second inorganic insulating layer on the inner surface of the first substrate;
an organic insulating layer between the first and second inorganic insulating layers, the organic insulating layer being disposed below the first inorganic insulating layer; and
a seal pattern between the first inorganic insulating layer and an inner surface of the second substrate, the seal pattern contacting at least part of the first inorganic insulating layer.

Also, independent claim 19 sets forth a novel fabricating method using an inorganic insulating layer:

19. A fabricating method of a liquid crystal display device, comprising:
forming a thin film transistor on a first substrate;
forming a passivation layer covering the thin film transistor, and the passivation layer includes an organic material;
forming an inorganic insulating layer on the passivation layer;
forming a seal pattern surrounding the thin film transistor; and
attaching a second substrate to the first substrate such that the seal pattern contacts the inorganic insulating layer and the second substrate.

Distinctions Of The Invention Over Tanaka And Moon

Tanaka pertains to a liquid crystal display having an inorganic insulating film 20 formed over an oxide interlayer insulating film 17. Figure 7 of Tanaka shows a sealant 45 contacting the

insulating film 20, which is respectively over leading portions of the signal lines 27 and the oxide interlayer insulating film 17.

Tanaka fails to disclose an inorganic insulating film, e.g., formed from silicon nitride (SiN_x), silicon oxide (SiO_2) or silicon oxynitride (SiO_xN_y) on the inner surface of the first substrate, and an organic insulating layer formed between first and second inorganic insulating layers.

In the present invention, the seal pattern partially or entirely contacts the first organic insulating layer, and the organic insulating layer is disposed below the first inorganic insulating layer. However, Tanaka fails to disclose either the inorganic insulating layers of the present invention or their distinctive geometry and function. Moon fails to address these deficiencies of Tanaka.

Also, The Examiner unequivocally admits to many of the failures of Tanaka regarding, e.g., claims 2-4 at page 4, lines 4-8 of the Office Action: "Tanaka lacks that a second inorganic insulating layer of silicon nitride (SiNx) or silicon oxide (SiO_2) or silicon oxynitride (SiOxNy) on the inner surface of the first substrate and an organic insulating layer of benzocyclobutene (BCB) or acrylic resin or methacrylic resin between the first and second inorganic insulating layers." The Examiner unequivocally admits to these failures of Tanaka regarding claims 19-20 at page 5, lines 5-6 of the Office Action: "Tanaka lacks that [*sic*] an inorganic insulating layer on the passivation layer (organic insulating layer)."

The Examiner then turns to Moon to address the admitted deficiencies of Tanaka.

Moon pertains to a liquid crystal display device having a gate insulating film 62 over which is respectively formed an organic protective layer 68 and a second protective layer 84.

Moon at column 4, lines 30-33 describes the protective layer 84: "For example, the second protective layer 84 may be formed of hydrogenated silicon nitride (H-SiNx) to increase the adhesive strength with the organic insulating material of the first protective layer 68." *See also* Moon at column 5, lines 31-37, which also teaches doping H into SiNx in order to promote adhesion.

That is, Moon selects a highly reactive H-SiNx material to react with the organic insulating material to promote adhesion and reduce lamination. In contrast, the present invention uses materials low reactive materials (SiN_x, SiO_2 or SiO_xN_y) so as to avoid reaction with organic materials, such as the epoxy and initiator in the sealant. As a result, substituting the high reactive inorganic layer of Moon into Tanaka would change the principle of operation. If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959). Also, using a material with a diametrically opposed property (high versus low reactivity) renders Moon unsuitable for its intended purpose. If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

Regarding claim 19, The Examiner asserts that Moon discloses an inorganic insulating layer 84 on the passivation layer 68 (Office Action at page 5, lines 7-9) to address what the Examiner admits is Tanaka's failure to disclose an inorganic insulating layer on the passivation layer, i.e., organic insulting layer (Office Action at page 5, lines 5-9). However, Tanaka

explicitly discloses that the inorganic insulating layer 20 contacting the seal pattern 45 is below the passivation layer 21 (see Fig. 7 of Tanaka). As a result, Tanaka and Moon disclose different stacking structures of the inorganic insulating layer and the passivation layer. If the references were combined, the illogical result would arise in that a) the inorganic insulating layer of Tanaka contacting the seal pattern and b) the inorganic insulating layer of Moon disposed on the passivation layer, would coexist in one LCD device. In contrast, the LCD device of claim 19 has only one inorganic insulating layer contacting the seal pattern and disposed on the passivation layer. Therefore, the combination of Tanaka and Moon is improper.

As a result one having ordinary skill in the art would have no motivation to combine Moon with Tanaka to produce the invention embodied in claims 1 or 19. That is, both claims 1 and 19 use an inorganic insulating layer to prevent defects, which is neither taught nor suggested in Moon and Tanaka. A *prima facie* case of obviousness has thus not been made. Claims depending upon claim 1 and 19 are patentable for at least the above reasons.

These rejections are overcome and withdrawal thereof is respectfully requested.

Allowable Subject Matter

The Examiner has indicated that claim 5-12 and 21-24 contain allowable subject matter. Claims 5 and 21 have been rewritten as independent claims. As a result, all of claims 5-12 and 21-24 are instantly allowable.

Prior Art

Prior art cited but not utilized by the Examiner indicates the status of the conventional art that the invention supercedes. Additional remarks are accordingly not necessary.

Drawings

The Examiner is respectfully requested to indicate whether the drawing figures are acceptable in the next Official Action.

Election/Restriction

The Examiner has withdrawn claims 13-18 and 26-29 from consideration. However, these claims depend on non-withdrawn claims and therefore would become instantly allowable upon the allowability of non-withdrawn subject matter. As a result, rejoinder is respectfully requested upon indication of allowable subject matter.

Conclusion

The Examiner's rejections have been overcome, mooted or obviated. No issues remain. The Examiner is accordingly respectfully requested to place the application in condition for allowance and to issue a Notice of Allowability.

Should there be any questions regarding this application, the Examiner is respectfully requested to contact Robert E. Goozner, Ph.D. (Reg. No. 42,593) at 703-205-8000.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any

additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

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Respectfully submitted,

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